We claim:

1. A sensor management system, comprising:

a mission manager structured and arranged to determine system information needs;

5   an information instantiator structured and arranged to select one of several measurement functions capable of satisfying the system information needs;

a set of sensors structured and arranged to collect data for estimating a state of the system, at least one of the sensors being capable of performing the selected measurement function; and

a sensor scheduler structured and arranged to identify at least one of the sensors to be used

10   for performing the selected measurement function.

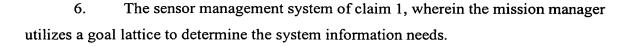2. The sensor management system of claim 1, further comprising:

a sensor fusion system structured and arranged to estimate the state of the system based on the data collected by the selected sensor;

15   memory structured and arranged to maintain a current state estimate of the system and other information that is useful in evaluating the current state of the system; and

a communication device structured and arranged to enable interaction by an operator with the memory.

20   3.   The sensor management system of claim 1, wherein the information instantiator is structured and arranged to select the one measurement function based on a first optimization criteria.

4.   The sensor management system of claim 1, wherein the sensor scheduler is

25   structured and arranged to identify sensors according to a second optimization criteria that is based on limitations and availability of sensors.

5.   The sensor management system of claim 4, wherein the second optimization criteria includes an online greedy urgency driven preemptive scheduling algorithm.

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6.   The sensor management system of claim 1, wherein the mission manager utilizes a goal lattice to determine the system information needs.

7.   A method for managing sensors of a system, comprising:

5   determining system information needs;

selecting one of several measurement functions capable of satisfying the system information needs; and

selecting at least one of several sensors capable of achieving the selected measurement function, the sensor selection being based on the availability of sensors capable of satisfying

10   the selected measurement function.

8.   The method of claim 7, wherein the availability of sensors is based on a level of detail required to achieve the selected measurement function and the capability of the sensors to achieve the level of detail required.

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9.   The method of claim 8, wherein the sensor selection involves giving preference to sensors that are capable of achieving the required level of detail but that are least capable of exceeding the required level of detail.

20   10.   The method of claim 7, further comprising:

estimating a state of the system based on the data collected by the selected sensor; and

storing an estimated current state for the system and other information that is useful in evaluating the current state of the system.

25   11.   The method of claim 7, further comprising:

monitoring feedback to determine whether the selected measurement function or selected sensor is unavailable; and

substituting a different measurement function or sensor when the feedback indicates that the selected measurement function or sensor is unavailable.

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12. The method of claim 11, wherein the selected sensor is unavailable when damaged, removed, or being used to accomplish measurement functions having a higher priority than the selected measurement function.

5 13. The method of claim 11, wherein the selected measurement function is unavailable when sensors are not available to accomplish the selected measurement function.

14. The method of claim 7, wherein determining system information needs comprises:
selecting a task capable of achieving system goals, wherein the task is selected based on
10 its ability to accomplish identified system goals; and
determining the system information required to perform the selected task.

15. The method of claim 14, wherein the selecting of the task comprises:
identifying several system goals and several tasks for implementing the system goals;
15 defining an ordering relationship among the identified system goals and tasks; and
determining a quantitative measure of the relative utility for each task based on a relative contribution of that task to the accomplishment of one or more of the system goals.

16. The method of claim 15, wherein the defining of the ordering relationship
20 includes:
identifying which of the tasks and system goals contribute to each of the other system goals.

17. The method of claim 14, wherein the determining of the quantitative measure
25 includes:
assigning a relative utility value for each of the system goals and tasks, the relative utility value defining the relative contribution of that task or system goal to the accomplishment of one or more of the system goals.

30 18. The method of claim 14, wherein the defining of the ordering relationship includes:

defining a graphical representation of the lattice in which the system goals are arranged on several layers,

each layer of system goals having a different level of abstraction relative to performing the system goals,

each system goal being defined as having a lower level of abstraction than the system goals promoted by that system goal, and

each task being defined as having a lower level of abstraction than the system goals promoted by that task.

19.   The method of claim 18, wherein the determining of the quantitative measure includes:

assigning relative utility values to each system goal and to each task, the relative utility values for each system goal and task being assigned based on a relative contribution of each system goal and task to the accomplishment of at least one dominant system goal that is defined by the ordering relationship to be on a layer of the lattice having a higher level of abstraction.

20.   The method of claim 19, wherein the assigning of relative utility values to the system goals and the tasks includes:

assuming a relative utility value for each of the highest system goals that are defined by the ordering relationship to be on a layer of the lattice having a highest level of abstraction; and

apportioning the relative utility values of each system goal among subservient system goals or tasks that are defined by the ordering relationship to be on a layer of the lattice having a lower level of abstraction,

where the numerical values are apportioned according to the relative contribution of each subservient system goal or task to the accomplishment of the apportioning system goal, and

wherein the numerical values apportioned by a particular system goal define the relative utility values of the subservient system goals or tasks, the sum of the relative utility values that are apportioned by a particular system goal being equal the numerical value of that system goal.

21.   The method of claim 20, wherein the assigning of a relative utility value to each system goal and each task also includes:

summing all relative utility values apportioned to each particular system goal to achieve the relative utility value for that particular system goal, and
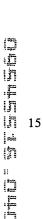
summing all relative utility values apportioned to each particular task to achieve the relative utility value for that particular task.

5   22.   The method of claim 21, the selecting of the task further comprises:

determining a priority among tasks by comparing the relative utility values assigned thereto.

23.   The method of claim 21, the selecting of the task further comprising:

allocating business resources among the tasks based on the relative utility values assigned to the tasks in order to improve the effectiveness of the business resources in accomplishing the

10   system goals.

24.   The method of claim 21, the selecting of the task further comprises:

collecting sensory input from different sensors based on the relative utility values assigned to the tasks.

25.   The method of claim 15, the selecting of the task further comprises:

15   determining the relative importance of the system goals based on a relative allocation of resources dedicated to the tasks.

26.   The method of claim 7, wherein the sensor management is utilized to control the sensors of a data collection platform including one of a satellite or military reconnaissance aircraft.

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27.   The method of claim 7, wherein the sensor management is used to acquire data from a network or database.

28.   The method of claim 7, health and utilization monitoring in order to automate a system.

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29. A computer readable medium storing a computer program that measures a relative utility for each of several different tasks based on system goals, the computer program comprising:

a first code segment that determines system information needs;

a second code segment that selects one of several measurement functions capable of satisfying the system information needs; and

a third code segment that selects at least one of several sensors capable of achieving the selected measurement function, the sensor selection being based on the availability of sensors capable of satisfying the selected measurement function.

30. The computer readable medium of claim 29, wherein the availability of sensors is based on a level of detail required to achieve the requested measurement function and the capability of the sensors to achieve the level of detail required.

31. The computer readable medium of claim 30, wherein the sensor selection involves giving preference to sensors that are capable of achieving the required level of detail but that are least capable of exceeding the required level of detail.

32. The computer readable medium of claim 29, further comprising:

a fourth code segment that estimates a state of the system based on the data collected by the selected sensor; and

a fifth code segment that stores an estimated current state for the system and other information that is useful in evaluating the current state of the system.

33. The computer readable medium of claim 29, further comprising:

a sixth code segment that monitors feedback to determine whether the selected measurement function or selected sensor is unavailable; and

a seventh code segment that substitutes a different measurement function or sensor when the feedback indicates that the selected measurement function or sensor is unavailable.

34.   The computer readable medium of claim 33, wherein the selected sensor is unavailable when damaged, removed, or being used to accomplish measurement functions having a higher priority than the selected measurement function.

35.   The computer readable medium of claim 33, wherein the selected measurement function is unavailable when sensors are not available to accomplish the selected measurement function.

36.   The computer readable medium of claim 29, wherein the first code segment that determines the system information needs comprises:

a code segment that selects a task capable of achieving system goals, wherein the task is selected based on its ability to accomplish identified system goals; and

a code segment that determines the system information required to perform the selected task.

37.   The computer readable medium of claim 36, wherein the code segment that selects the task comprises:

a code segment that identifies several system goals and several tasks for implementing the system goals;

a code segment that defines an ordering relationship among the identified system goals and tasks; and

a code segment that determines a quantitative measure of the relative utility for each task based on a relative contribution of that task to the accomplishment of one or more of the system goals.

38.   The computer readable medium of claim 37, wherein the code segment that defines the ordering relationship includes:

a code segment that identifies which of the tasks and system goals contribute to each of the other system goals.

39.   The computer readable medium of claim 37, wherein the code segment that determines the quantitative measure includes:

a code segment that assigns a relative utility value for each of the system goals and tasks, the relative utility value defining the relative contribution of that task or system goal to the accomplishment of one or more of the system goals.

5   40.   The computer readable medium of claim 37, wherein the code segment that defines the ordering relationship includes:

a code segment that defines a graphical representation of the lattice in which the system goals are arranged on several layers,

each layer of system goals having a different level of abstraction relative to performing the

10   system goals,

each system goal being defined as having a lower level of abstraction than the system goals promoted by that system goal, and

each task being defined as having a lower level of abstraction than the system goals promoted by that task.

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41.   The computer readable medium of claim 40, wherein the code segment that determines the quantitative measure includes:

a code segment that assigns relative utility values to each system goal and to each task, the relative utility values for each system goal and task being assigned based on a relative

20   contribution of each system goal and task to the accomplishment of at least one dominant system goal that is defined by the ordering relationship to be on a layer of the lattice having a higher level of abstraction.

42.   The computer readable medium of claim 41, wherein the code segment that assigns

25   relative utility values to the system goals and the tasks includes:

a code segment that assumes a relative utility value for each of the highest system goals that are defined by the ordering relationship to be on a layer of the lattice having a highest level of abstraction; and

a code segment that apportions the relative utility values of each system goal among

30   subservient system goals or tasks that are defined by the ordering relationship to be on a layer of the lattice having a lower level of abstraction,

where the numerical values are apportioned according to the relative contribution of each subservient system goal or task to the accomplishment of the apportioning system goal, and

wherein the numerical values apportioned by a particular system goal define the relative utility values of the subservient system goals or tasks, the sum of the relative utility values that are apportioned by a particular system goal being equal the numerical value of that system goal.

43. The computer readable medium of claim 42, wherein the code segment that assigns a relative utility value to each system goal and each task also includes:

a code segment that sums all relative utility values apportioned to each particular system goal to achieve the relative utility value for that particular system goal, and

a code segment that sums all relative utility values apportioned to each particular task to achieve the relative utility value for that particular task.

44. The computer readable medium of claim 43, the code segment that selects the task further comprises:

a code segment that determines a priority among tasks by comparing the relative utility values assigned thereto.

45. The computer readable medium of claim 43, the selecting of the task further comprising:

a code segment that allocates business resources among the tasks based on the relative utility values assigned to the tasks in order to improve the effectiveness of the business resources in accomplishing the system goals.

46. The computer readable medium of claim 43, the selecting of the task further comprises:

a code segment that collects sensory input from different sensors based on the relative utility values assigned to the tasks.

47. The computer readable medium of claim 37, the selecting of the task further comprises:

a code segment that determines the relative importance of the system goals based on a relative allocation of resources dedicated to the tasks.